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United States Department of Agriculture
Agricultural Research Administration
Bureau of Entomology and Plant Quarantine

A SPECIAL CHAMBER FOR TESTING INSECTICIDAL SPRAYS 1/

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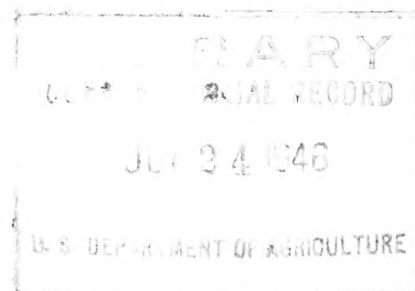
A common method of testing fine-mist sprays against houseflies and mosquitoes is to expose the free-flying insects in a Peet-Grady chamber. When using this method, however, it is necessary to wash or cover the interior of the chamber after each test to prevent the insects from contacting surfaces bearing a deposit of insecticide from previous tests. This is particularly important with materials such as DDT, the residues of which have an insecticidal effect. To overcome this difficulty a special spray chamber was designed at the Orlando, Fla., laboratory of this Bureau in which insects were exposed in small screen-wire cages by a swinging pendulum method to a fine mist of insecticides. This method has been used satisfactorily since the early part of 1944.

Description of Chamber

The chamber is constructed of 1/4-inch plywood placed over a light frame (fig. 1). The inside dimensions are 5 by 5 by 4 feet, giving a capacity of 100 cubic feet. A spray aperture (A), 3 inches in diameter, is located in the center of the front. This aperture is closed by a swinging cover (B) when not in use. An opening in the top, 4 1/2 by 13 1/2 inches, with a tight cover (C), provides a means of introducing the insects into the chamber. Observation windows (D) may be fitted into the front and rear of the chamber if desirable.

An exhaust unit, consisting of a 12-inch electric fan mounted inside a wooden conduit 13 5/8 inches square, is fixed at the rear of the chamber. The conduit leads to the outside of the building, and the end attached to the chamber is equipped with a closely fitting slide. The fan, which operates at full speed, is capable of moving 900 cubic feet of air per minute. A door (E) at one

1/ This work was conducted under a transfer of funds, recommended by the Committee on Medical Research, from the Office of Scientific Research and Development to the Bureau of Entomology and Plant Quarantine.



side of the chamber permits clean air to be drawn in from the test room as the contaminated air is exhausted.

The sprayer consists of a DeVilbiss hand-controlled paint nozzle (F) operated by an electric compressor (G) at a pressure of 18 pounds per square inch. This equipment produces particles with an average diameter of approximately 18 microns when the nozzle is adjusted to spray the finest possible mist.

The exhaust fan and compressor motor operating the sprayer are controlled by switches mounted conveniently outside of the chamber.

A wooden pendulum (H), $1\frac{1}{2}$ feet long and constructed from 1-by-2-inch stock, is used in exposing the insects. The pendulum swings freely in the cover at the top of the chamber. Two cylindrical cages, $7\frac{1}{2}$ inches high and $2\frac{3}{4}$ inches in diameter, and made of 16-mesh screen wire, are fixed to the end of the pendulum arm by means of metal trouser clips. The upper clips should be spread so that they will not grasp the tops of the cages too tightly and pull them off when the cages are being fastened or removed. Exposing the insects in these cages prevents them from coming in contact with the inner surfaces of the cabinet. The pendulum prevents the cages from hitting the sides of the chamber, but permits the lower ends of the cages to pass through the center of the chamber as the pendulum is being operated. A short ladder (I) enables the operator to reach the top of the chamber.

Testing Procedure

The spray is discharged into the chamber and the cover of the spray aperture is then swung into place. After a given settling period, the pendulum, with the exposure cages attached, is inserted through the opening in the top of the chamber. The pendulum is swung moderately during exposure to simulate natural flight and to aid in the passage of spray particles through the wire mesh of the cages. Following exposure the insects are transferred to clean cages for knock-down and mortality counts.

Between tests the spray nozzle is washed with acetone and the chamber is aired. In airing, the fan is started, the slide pulled, and the door opened. All the contaminated air can be removed from the chamber in 2 to 3 minutes. This time limit has been established by exposing houseflies in the testing chamber for 1 hour following various periods of airing. If two chambers are used, one can be airing while a test is in progress in the other.

Since the necessary exposure period for mosquitoes is much shorter than that for houseflies, a test against both insects may be completed with one spraying. After a settling period of 10 to 15 seconds the mosquitoes are exposed for 10 seconds or more, depending upon the dosage. The houseflies are then exposed before too long a settling period (usually 30 seconds) has elapsed. The dosage and the exposure period must be adjusted, as in other methods of testing, to keep knock-down and mortality within the proper limits for making comparisons.

When knock-down records are completed, the insects are fed and watered by placing a drop of honey and a bit of water-soaked cotton on the outside of each cage. The cages are placed in cardboard cartons of convenient size and stored at a constant temperature until the 24-hour mortality counts are made. When all records are completed, the remaining live insects are killed by placing the cages in an electric oven for a few minutes. This makes it possible to determine the total number per cage and to calculate mortality.

The screen-wire cages are washed in white gasoline and acetone after each test, and the holding cages are washed biweekly. Placing a tight-fitting white cardboard disk in the solid bottom of each holding cage facilitates the making of knock-down and mortality counts.

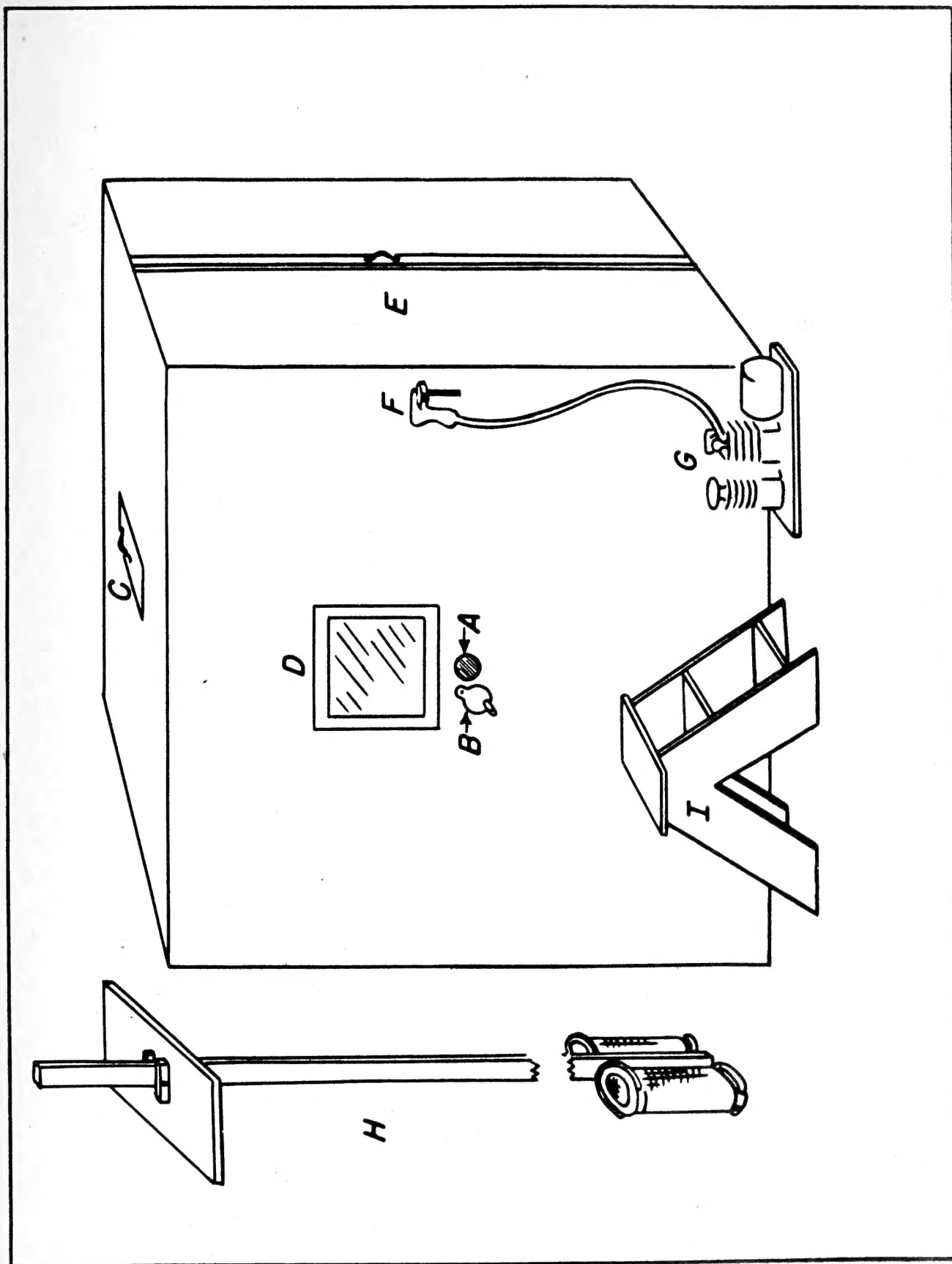


Figure 1.--Spray chamber and detailed drawing of exposure pendulum with cages in place.

